J. Life Earth Sci., Vol. 6: 113-115, 2011 **ISSN 1990-4827**
http://banglajol.info.index.php/JLES

Short Communication

REPELLENT ACTIVITY OF *DERRIS INDICA* EXTRACTS AGAINST *TRIBOLIUM CASTANEUM* (HERBST) ADULTS

Omar Ali Mondal, Hedayetul Islam, Sukumar Biswas[1] and Nurul Islam[*]

Department of Zoology, University of Rajshahi, Rajshahi 6205, Bangladesh
[1]Department of Biotechnology and Genetic Engineering,
Islamic University, Kushtia 7003, Bangladesh
*Corresponding author (email: nurulislam@ru.ac.bd)

mvivsk: Pv‡ji ‡Kwo †cvKv (*Tribolium castaneum*)-Gi Ici *Derris indica* Bennet. (KiÄv)-Gi d‡ji ‡Lvmv, cvZv, g‡ji evKj, g‡ji KvV, exR, Kv‡Êi evKj I Kv‡Êi Kv‡Vi †Kv‡ivdg wbhvm c‡qv‡M G¸wji weZvob KvhKwiZv ch‡e¶Y Kiv nq, hv‡Z d‡ji ‡Lvmv, cvZv, exR, Kv‡Êi evKj wbhvm mwµqZv †`wL‡q‡Q- hLb wbhvm¸wji weci‡Z F-ratios (df 7, 28) wQj h_vµ‡g 5.08, 12.97, 15.27 Ges 11.08| Aek¨ cvZv, exR I Kv‡Êi evKj wbhvm Zjbvgj Kfv‡e fvj mwµqZv †`wL‡q‡Q (P<0.001), d‡ji ‡Lvmvi †¶‡Î hv wQj A‡c¶vKZ `ej (P<0.05), Ges g‡ji evKj I g‡ji KvV †KvbB KvhKwiZv †`Lvqwb; Avi KvhKwiZvi gvÎvbhvqx wbhvm¸wj‡K exR > cvZv > Kv‡Êi evKj > d‡ji ‡Lvmv µgvYmv‡i mvRvb hvq|

Key words: Repellent activity, *Derris indica*, *Tribolium castaneum.*

The Pongam tree *Derris indica* Bennet. (Family Fabaceae) is cultivated mainly for two purposes: an ornamental plant in gardens and along avenues and roadsides, for its fragrant wisteria like flowers, and a host plant for lac insects (Rama Murti and Seshadri 1944). The gardeners use well-decomposed flowers as compost for plants requiring rich nutrients. It is appreciated as an ornamental plant throughout coastal India and all of Polynesia. This tree is an inhabitant of SriLanka, Myanmar, Thailand, Laos, Cambodia, Vietnam, Malaysia, Indonesia and North Australia, and occurs in Bangladesh mainly in the tidal forests and also often along river and canal banks in all districts (Kirtikar and Basu 1935).

D. indica is a medicinal plant, the dried flowers of which are used in decoction to quench thirst in diabetes; and the seeds are mainly valued for the oil obtained from them, which has many industrial and medicinal uses (Kirtikar and Basu 1935). The Pongam oil is non-edible and used for tanning leather, as an ingredient in soap; as a liniment to treat scabies, herpes and rheumatism and as an illuminating oil (Burkill 1966). Powdered seed is valued as a febrifuge and tonic, and used also in bronchitis and whooping cough (Kirtikar and Basu 1935). It is also used to lubricate cattle cartwheels by the native people of Bangladesh. In addition, the juice of the leaves is prescribed in flatulence dyspepsia, diarrhoea and cough; and also is considered as a remedy for leprosy and gonorrhoea. A hot infusion of the leaves is used as a medicated bath for relieving rheumatic pains, and for cleansing foul ulcers and sores. The stem-bark is fibrous and is used for cordage. The fresh bark has a feebly sweetish and mucilaginous taste at first but soon becomes bitter combined with a sort of pungency. It is given internally in bleeding piles (haemorrhoids). A decoction of the bark is used for beriberi. It shows positive tests for the presence of alkaloids, triterpenoid and saponin. A paste of the roots is used for local application in scrofulous enlargements. Extracts of the leaves were active against *Micrococcus pyogenes* var. *aureus* (Anon 1969). The juice of the roots is used for cleansing foul ulcers and closing fistulous sores and for cleaning teeth and strengthening gums. Roots are used as fish-poison by the aborigines of Australia (Kirtikar and Basu 1935). Insecticidal activity of this plant against the pulse beetle *Callosobruchus maculatus* had been traced (Mondal and Islam 2008). Moreover, both antibacterial and larvicidal potentials of this plant had also been reported (Mondal *et al.* 2010). Being a member of the rotenone containing family Fabaceae this plant deserves an especial attention, however, still the information on biological activities of *D. indica* is scanty, but it requires a thorough investigation of its properties to step up for their possible use in the pest control technology. This is just a part of a research endeavor entitled characterization of Karanja, where biological activities and phytochemical investigation of *D. indica* compo-nents have been targeted.

The fresh leaves, fruit shell, root bark, root wood, seeds, stem bark, and stem wood of *D. indica* were collected from the campus of the University of Rajshahi,

Bangladesh. After drying the plant parts were powdered in a grinder machine separately avoiding excess heat during grinding. Chloroform was selected to extract seven different parts of *D. indica* separately. The ground dried materials were extracted with sufficient amount of chloroform (500g × 1500ml × 3 times) for each of the items. Separate extracts were collected by the cool method after 72h of plunging for each of the materials. Extracts thus obtained as residue after filtration and evaporation of the solvent were kept in a refrigerator with proper labeling.

Table 1. Ranges in percent repulsion (PR) of chloroform extracts assessed for various parts of *D. indica* against adult *T. castaneum.*

Doses µg cm^{-2}	Fruit shell (PR ranges)	Leaves (PR ranges)	Root bark (PR ranges)	Root wood (PR ranges)	Stem bark (PR ranges)	Stem wood (PR ranges)	Seed (PR ranges)
12	33.32-80.00	33.32-46.66	20.00-80.00	13.32-66.66	20.00-80.00	26.60-73.20	20.00-60.00
25	20.00-80.00	33.32-66.66	6.66-80.00	0.00-53.32	40.00-66.66	33.20-80.20	40.00-73.32
49	46.66-60.00	80.00-93.32	6.66-80.00	6.66-80.00	33.32-53.32	46.60-73.20	0.00-20.00
98	6.66-53.32	66.66-100.00	6.66-66.66	13.32-60.00	46.66-73.32	53.20-86.60	33.32-53.32
197	0.00-6.66	46.66-93.32	20.00-80.00	0.00-60.00	0.00-13.32	40.00-86.60	26.66-66.66
393	20.00-26.66	86.66-100.00	33.32-80.00	0.00-40.00	0.00-33.32	6.60-80.00	13.32-53.32
786	0.00-60.00	33.32-80.00	33.32-66.66	0.00-53.32	0.00-13.32	0.00-53.20	33.32-66.66
1573	20.00-53-32	60.00-93.32	46.66-80.00	6.66-66.66	0.00-33.32	53.33-86.66	66.66-93.32

Table 2. ANOVA components showing the effects of various parts of *D. indica* extracts on *T. castaneum* adult by repellency tests.

Test materials	Sources of variance	Df	F-ratios
Fruit shell	Doses	7/28	5.08***
	Time intervals	4/28	0.67ns
Leaf	Doses	7/28	12.97***
	Time intervals	4/28	5.75**
Seed	Doses	7/28	15.27***
	Time intervals	4/28	1.21ns
Stem bark	Doses	7/28	11.08***
	Time intervals	4/28	2.83*

Df = degrees of freedom; * = P <0·05; ** = P < 0·01; *** = P < 0·001; ns = not significant.

A general concentration for each of the extracts as stock dose was prepared to make other successive doses by serial dilution that gave 1573, 787, 393, 197, 98, 49, 25 and 12 µgcm^{-2} concentrations for surface film application. The repellency test used was adopted from the method (No. 3) of McDonald *et al.* (1970) with some modifications by Talukder and Howse (1993, 1994). Half filter paper discs (Whatman No. 40, 9cm diameter) were prepared and selected doses of all extracts were applied separately onto each of the half-discs and allowed to dry out as exposed in the air for 10 min. Each treated half-disc was then attached lengthwise, edge-to-edge, to a control half-disc with adhesive tape and placed in Petri dishes. The orientation of the same was changed in the replica to avoid the effects of any external directional stimulus affecting the distribution of the test insects. Ten adult insects were released in the middle of each of the filter paper circles. Each concentration was tested five times. Insects that settled on each half of the filter paper discs were counted after 1h and then at hourly intervals for 5 hrs. The average of the counts was converted to percent repellency (PR) using the formula of Talukder and Howse (1993, 1995): PR = (Nc – 5) × 20, where Nc was the number of insects present on the control half of the disc. Positive values expressed for repellency and negative values for attractant activities. The data recorded as PR were again converted by *arcsin* transformation for the calculation of ANOVA.

Among the seven extracts the fruit shell, leaves, seed, and stem bark extracts showed repellent activity (Table 1), while the ANOVA results (Table 2) offered F-values 5.08, 12.97, 15.27 and 11.08 respectively for 7 degrees of freedom with an error df of 28 to reveal that the leaves, seeds and the stem bark contain stronger repellent properties (P<0.001) than the fruit shell extract (P<0.05). However, the stem wood, root bark and root wood extracts showed no repellency at all. The P values were found 2.602E-07, 0.000814223, 4.759E-08, 1.235E-06 for the leaf, fruit shell, seed, stem bark extracts respectively and thus the intensity of repellent activity of the test materials it could be arranged in descending order seed > leaf > stem bark > fruit shell.

This finding is similar to that of Khan (1983) who also reported the repellent activity of *D. indica* against stored product insect pests. Sighamony *et al.* (1984) reported that the oils of cedar wood, karanja and acetone extract of black pepper were more potent than other standard

repellents and the repellency of karanja oil persist strongly over the 8 weeks of experimental period. However, this plant possesses efficacy other than insect repulsion, while antibacterial activity of 3 *Derris* species' extractives collected in different organic solvents revealed by Khan *et al.* (2006), and this work confers no antifungal activity. Biswall *et al.* (2011) confirmed presence of flavonoids, alkaloids, saponins and steroids through phytochemical screenings.

Acknowledgements: The authors are thankful to the University Grants Commission (UGC) and the Ministry of Science and Information & Communication Technology (MOSICT) of Bangladesh for financial support; and grateful to the Chairman, Department of Zoology, University of Rajshahi, and Director, Institute of Biological Sciences, University of Rajshahi, Bangladesh for providing laboratory facilities.

Reference

Anon. 1969. *The Wealth of India*-A dictionary of Indian raw materials and industrial products. CSIR, New Delhi, India. 210 pp.

Biswal1 B, Saha D, Beura S, Jana SB, Koley A, Sur D and Mohanty JC. 2011. Pharmacognostic studies of leaves of *Derris indica*. *Int. J. Res. Pharm. Biomed. Sci.* **2**(1): 294-296.

Burkill JH. 1966. *A Dictionary of Economic Products of the Malay Peninsula.* Art Printing Works, Kuala Lumpur. 2 vols.

Khan MA. 1983. Effectiveness of insecticides and repellents on stored product insect pests. *J. Pest. Sci.* **56**(2)**:** 19.

Khan MR, Omoloso AD and Barewai Y. 2006. Antimicrobial activity of the *Derris elliptica, Derris indica* and *Derris trifoliata* extractives. *Fitoterapia* **77**(4): 327-330.

Kirtikar KR and Basu BD. 1935. *Indian Medicinal Plants.* Vol. III (2nd edn). Basu LM, Allahadad, India. pp.1593-2393.

McDonald LL, Guy RH and Speirs RD. 1970. Preliminary evaluation of new candidate materials as toxicants, repellents and attractants against stored-product insects. Agricultural Research Service, U.S. Department of Agriculture, Washington D.C., Marketing Research Report No. 882.

Mondal OA, and Islam N. 2008. Toxicity of chloroform extracts of *Derris indica* Bennet. against *Callosobruchus maculatus* (F.) adults. *Univ. j. zool. Rajshahi Univ.* **28:** 95-96.

Mondal OA, Haque ME & Islam N. 2010. Antibacterial and larvicidal potentials of *Derris indica* (Lamk.) Bennet. extractives. *Univ. j. zool. Rajshahi Univ.* **29:** 21-26.

Rama Murti and Seshardi, 1944. In: *The Wealth of India* (A Dictionary of Raw Materials and Industrial Products) Vol. VIII. CSIR. New Delhi, 1969. pp. 206-210.

Sighamony S, Anees I, Chandranakala TS and Osmani Z. 1984. Natural products as repellents for *Tribolium castaneum* Herbst. *Int. Pest Control* **26:** 156-157.

Talukder FA and Howse PE. 1993. Deterrent and insecticidal effects of extracts of pithraj, *Aphanamixis polystachea* (Meliaceae), against *Tribolium castaneum* in storage. *J. Chem. Ecol.* **19**(11)**:** 2463-2471.

Talukder FA and Howse PE. 1994. Efficacy of pithraj (*Aphanamixis polystachya*) seed extracts against stored-product pests. *Proc. Int. Working Conf. on Stored-prod. Protec.* **2:** 848-852.

Talukder FA and Howse PE. 1995. Evaluation of *Aphanamixis polystachya* as a source of repellents, antifeedants, toxicants and protectants in storage against *Tribolium castaneum* (Herbst). *J. Stored Prod. Res.* **31:** 55-61.

Manuscript received on 6 August 2011 and revised on 3 December 2011